

CLAIMS

What is claimed is:

1. A flexible tubular article for transport of volatile hydrocarbons permitting only negligible escape of such vapors comprising:
 - (a) a relatively thin, inner layer of an elastomeric form of an FKM fluoropolymer, and;
 - 5 (b) a relatively thin intermediate layer of a thermoplastic form of an 800 grade THV fluoropolymer extruded in tubular form over the inner FKM inner layer and the intermediate THV layer together having a transverse thickness sufficient to present a barrier to volatile hydrocarbon escape, and
 - 10 (c) a durable outer layer of an elastomeric polymer bonded to the outside surface of the intermediate layer and being coextensive therewith.
2. The article according to claim 1 wherein the thickness of the FKM inner layer ranges from about 0.010 to 0.080 in (.25 to 2 mm).
3. The article according to claim 2 wherein the thickness of the THV intermediate layer ranges from about 0.001 to 0.020 in (.025 to .5 mm).
4. The article according to claim 3 wherein the thickness of the elastomeric polymer outer layer ranges from about 0.075 – 0.150 in. (2 to 4 mm).
5. The article according to claim 4 wherein the elastomeric polymer is selected from the group consisting of chlorinated polyethylene, ECO, ethylene acrylic, polyacrylate, NBR/PVC, chlorosulfonated polyethylene and mixtures thereof.
6. The article according to claim 1 and further comprising a first tie layer between the intermediate and elastomeric polymer layers.
7. The article according to claim 6 wherein the first tie layer comprises a nitrile rubber or an ethylene acrylic rubber compound.

8. The article according to any claim 1 and further comprising a second tie layer between the inner FKM inner layer to the THV 30G intermediate layer to bind the two layers together.

9. The article according to claim 8 wherein the second tie layer is a THV 500G compound.

10. The article according to claim 1 wherein the thickness of the intermediate THV layer ranges from about 0.001 to 0.020 inches (0.025 to 0.50 mm).

11. The article according to claim 1 wherein one or more thermoplastic THV tie layers of increasing TFE content bind the inner FKM inner layer to the THV 800 intermediate layer.

12. The article according to claim 1 wherein the thickness of the elastomeric polymer layer ranges from about 0.075 – 0.150 in. (2 to 4 mm) and the elastomeric polymer is selected from the group consisting of chlorinated polyethylene, ECO, ethylene acrylic, polyacrylate, NBR/PVC, chlorosulfonated polyethylene and mixtures thereof.

13. The article according to claim 1 wherein the inner layer is conductive.

14. The article according to claim 1 and further comprising a reinforcing layer between the intermediate THV layer and the outer layer.

15. A process for making a tubular article which is substantially impermeable to volatile hydrocarbons, said process comprising the steps:

(a) extruding a plurality of relatively thin intermediate layers of a thermoplastic form of an THV fluoropolymer, each with increasing amounts of fluorine content, over an inner elastomeric FKM layer in a tubular shape; and

(b) crosshead extruding onto the tubular shape a durable outer layer of a second elastomeric polymer to form a composite tubular article.

16. A process according to claim 15 and further comprising the step of applying to the tubular shape a binder to bond the 800 THV fluoropolymer to the elastomeric polymer prior to the crosshead extruding step.

17. A process according to claim 16 wherein the binder comprises a nitrile rubber or an ethylene acrylic rubber compound.

18. The process according to claim 15 wherein the thickness of the first elastomeric polymer layer is in the range of about 0.010 to 0.080 in (.25 to 2 mm).

19. The process of claim 18 wherein the thickness of each of the intermediate layer or layers is relatively thin and ranges from about 0.001 to 0.020 inches (0.025 to 0.50 mm).

20. The process of claim 19 wherein the thickness of the elastomeric polymer layer is in the range of about 0.075 – 0.150 in. (2 to 4 mm).

21. A process according to claim 15 and further comprising the steps of cutting the composite tubular article to lengths, partially curing the composite tubular article in straight condition to cross-link at least the elastomeric polymer layer to the grade 800 THV fluoroplastic polymer, shaping the partially cured composite article and fully curing the shaped composite article.

22. The process for making a tubular article according to claim 15 and further comprising the step of forming a reinforcing layer on the binder layer between the extruding and crosshead extruding steps.

23. A flexible tubular article for the transport of volatile hydrocarbon vapors and vaporous combustion products and permitting only negligible escape of such vapors comprising:

(a) a relatively thin, inner layer of an elastomeric form of an FKM fluoropolymer;

(b) a plurality of relatively thin intermediate layers of a thermoplastic form of a non-elastomeric form of a THV fluoropolymer, each with increasing amounts of TFE content, extruded in successive tubular layers over the inner FKM layer, the FKM inner layer and the intermediate THV layers, together having a transverse thickness and fluorine content sufficient to present an effective barrier to volatile hydrocarbon escape through the walls of the tubular article, and

(c) a durable outer layer of an elastomeric polymer bonded to the outside surface of the outermost of the intermediate layers and being coextensive therewith.

24. The article of claim 23 and further comprising a binder layer between the intermediate THV layers and the durable outer layer.

25. The article of claim 24 wherein the binder layer comprises a nitrile or ethylene oxide rubber compound and the elastomeric polymer is selected from the group consisting of chlorinated polyethylene, ECO, ethylene acrylic, polyacrylate, NBR/PVC, chlorosulfonated polyethylene and mixtures thereof.

26. The flexible tubular article according to claim 23 and further comprising a reinforcing layer between the tubular intermediate layers of THV fluoropolymer and the durable outer layer.